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The Contribution of Cardiac MRI: Data from our Recent Experience at "Evagelismos" Hospital

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ABSTRACT

Cardiovascular magnetic resonance imaging (MRI) is established in clinical practice for the diagnosis and management of diseases of the cardiovascular system and has been shown to provide highly accurate and reproducible measurements of cardiodynamic parameters and for the assessment of cardiac morphology. We present our recent experience in cardiac imaging with MRI. The aim of this presentation is to focus on MRI findings of various cardiovascular diseases, as an alternative non invasive imaging method for diagnosis and follow-up of these patients. Cardiovascular magnetic resonance (CMR) is established in clinical practice for the diagnosis and management of diseases of the cardiovascular system. CMR is very safe and no long-term ill effects have been demonstrated. Considerable technical and practice advances have been made over the last several years´H. MRI was introduced into clinical routine for the assessment of cardiac morphology more than 10 years ago. The multiplanar cross-sectional nature inherent to cine-MR imaging coupled with high spatial and temporal resolution has been shown to provide highly accurate and reproducible measurements of cardiodynamic parameters and must be considered as the standard of reference for the assessment of ventricular volumes, ejection fraction, and regional wall motion abnormalities.

KEY WORDS: *cardiac MRI; clinical applications*

Abbreviations and Acronyms
CMR= Cardiovascular magnetic resonance
CHD= Congenital heart disease
CAD= coronary artery disease

MATERIAL AND METHODS

Cardiac Magnetic Resonance imaging was performed on a 1,5T scanner (Signa Excite, GE) in our Radiology department. After the initial gradient echo localizer in the three orthogonal planes the following sequences were acquired: vector cardiogram triggered balanced Fiesta in single-slice, multiphase mode in the long axis, pseudo-short axis, and four-chamber plane. The same sequence was applied in multislice multiphase mode, in true short-axis plane, covering the whole area of the left ventricle (LV) and right ventricle (RV). A cine Fiesta sequence was acquired in the four chamber plane. Cardiac triggered, flow sensitive phase-contrast gradient echo sequences were obtained at levels perpendicular to the long axis of the ascending aorta and the main pulmonary artery.

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RESULTS

More than 100 patients (114) were examined over the last year in our department with various cardiovascular diseases. Image analysis was performed on a workstation (report-card GE) using the cardiac analysis package. Evaluation included biventricular mass, dimensions and end-diastolic, end-systolic volumes, ejection fraction and stroke volume as well as aorta and pulmonary artery flow measurements.

DISCUSSION

The most important clinical applications of CMR in our days are:

1. Evaluation of patients with congenital heart disease (CHD) is a significant strength of CMR because 3D contiguous data sets are very effective for the complete depiction of the pathological anatomy of both simple and complex CHD. Moreover, the lack of ionizing radiation is an important consideration when performing sequential studies in children and young adults
2. CMR is well-established for evaluation of a wide variety of acquired vascular diseases. CMR is particularly useful for vascular lumen imaging with its ability to generate projection angiograms. In addition to morphologic imaging of blood vessels, velocity mapping can be used to assess and measure the blood flow.
3. CMR has opened new avenues for assessing coronary artery disease (CAD) and its consequences. It provides valuable information which may not be available from other diagnostic tools such as echocardiography and nuclear cardiology, which currently dominate non-invasive diagnosis in patients with CAD. Its superb spatial and temporal resolution combined with excellent soft tissue contrast allow for accurate assessment of cardiac morphology, global cardiac function, regional wall motion, and the extent of myocardial infarction.
4. The cardiomyopathies include a variety of diseases where the primary pathology directly involves the myocardium excluding CAD. CMR is proving increasingly valuable in the identification and management in these conditions
5. Both CMR and CT are well suited to define anatomic abnormalities of the pericardium including pericardial thickening and effusions. CMR has the advantage of being able to depict and quantify the functional abnormalities which may be associated with pericardial disease. The large field of view of CT and CMR is helpful in providing a better overview of the extent of pericardial disease, and to define the relationship with surrounding anatomic structures. For suspected pericardial thickening, CMR and CT are primary imaging modalities, with CT having an advantage for identification of pericardial calcium.
6. Furthermore, CMR is a valuable tool for individual follow-up of the severity of regurgitant lesions and for quantification of the effects of valvular lesions on ventricular volumes, function and myocardial mass.
7. CMR is particularly helpful in determining the relationship to normal intracardiac structures and tumour extension to adjacent vascular and mediastinal structures, infiltration into the pericardium, and surgical planning. In addition to this, there are a number of CMR features which can assist in tumour characterization.

The aim of this presentation is to focus on MRI findings of various cardiovascular diseases, as an alternative non invasive imaging method for diagnosis and follow-up of these patients, due to the assessment of cardiovascular morphology and function which can be perfectly demonstrated on CMR